

Huxley to Haeckel, and the present work is an "Haeckelismus" without the redeeming grace of genius. It is dogmatic, and, still worse, it is dull.

The question of the origin of life is easy to the author. Scattered through infinite space and time is carbon, which in its original state forms the simplest germs of life (Zoatoms). These are so small that even under the highest magnification they are seen only as an irresolvable dust. It is they alone which are able to assimilate the carbon which has lost its life (we are not told how it loses its life). When the earth was molten the Zoaatoms surrounded it like an atmosphere, like the meteorites around a heavenly body. Then, of course, come Protists, Protophytes, and Protozoa, and all is plain sailing until we reach the commencement of the Cambrian, where we, for the first time, encounter fossil remains; not, however, representing, as we might expect, the beginnings of life, but all, or almost all, the great subdivisions of the Invertebrata. This remarkable fact has taxed the ingenuity of geologists not a little; the author makes short work of it; two or three pages are devoted to describing the various kinds of rock metamorphism, one or other of which is asserted to have blotted all the pre-Cambrian fossils out of existence, except Eozoon, which is most likely a Stromatopora-like organism, saved by a strange chance from destruction.

Geologists, the author says, have spoken of a Carboniferous continent—Glossopteris land; this is "grund falsch," and contradicted by the facts (which are not cited).

The notion of pre-Tertiary glacial epochs is widely accepted by geologists, but it is "grund falsch" and "unthinkable." A deep sea before the Triassic period is also "unthinkable." No climatic zones were "possible" before the Tertiary era.

The profile of the Pithecanthropoids is still *very* ape-like, as is seen in the lowness of the forehead, the projecting jaws and retreating chin, the slope of the occiput, and the size of the face. (This statement is arrived at by piecing together Neanderthal man and Pithecanthropus.)

After all this, we are glad to be assured that the soul is immortal; it resides in the Zoaatoms, and so may be dispersed, but not destroyed.

There are several references in footnotes, almost without exception to other works by the author.

OUR BOOK SHELF.

Grundlagen der Ballonführung. By Prof. R. Emden. Pp. vii + 140 + Taf. 3. (Leipzig and Berlin: B. G. Teubner, 1910.) Price 2.80 marks.

This book contains twenty-two paragraphs or chapters. It opens with a statement of the general laws governing the relations of a balloon to the air which supports it, beginning with the density of the gases employed and their lifting forces, and proceeding with the consideration of the distribution of force in the envelope.

Balloons are classified by the author as being of constant mass or constant volume (*i.e.* as having closed or open envelopes), and the behaviour of the classes in rising and falling is discussed.

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The proper use of ballast is treated, and the importance of having too much ballast rather than too little is emphasised. Paragraph 18 deals with captive balloons, especially with regard to the height to which they can ascend in a wind. The diagram illustrating this point appears to be wrong, the construction employed indicating that the height in question is $L(1 - \cos \alpha)$, where L is the length of the rope and α its inclination to the vertical, instead of $L \cos \alpha$ (as it should be).

The subsequent paragraphs are connected with the use of the ballonnet and the relative merits of closed and open envelopes, and, finally, in paragraph 22 some remarks are made on the steering of dirigible balloons.

There does not appear to be much that is new in the book, but it has the merit of being compact, and most of the information it contains appears to be correct.

For how long frail structures such as balloons will have a place in warfare when opposed to the hardier, cheaper, and quicker flying machines is a question which will be decided in the next few years, but for so long at any rate Dr. Emden's book will be found useful.

A. MALLOCK.

Vaccine Therapy: its Theory and Practice. By Dr. R. W. Allen. Third edition. Pp. x + 277. (London: H. K. Lewis, 1910.) Price 7s. 6d. net.

THE principle of treating bacterial infections by vaccines, *i.e.* sterilised preparations of the organisms which are disturbing the normal balance, has taken firm hold in modern English medicine. It has not reached its present position without a struggle, and even now it must be admitted that the proof of its usefulness depends more on the cumulative weight of personal impressions than on any rigid demonstration such as an extensive case-statistic would supply. In practice, however, an increasing body of influential opinion is in its favour, and the acceptance with which former editions of this work has been received shows that it meets a demand.

The present issue, which has been entirely rewritten, aims at "enabling the general practitioner to approach with confidence a case requiring therapeutical immunisation." With this object a sketch is given of the nature of opsonins, the use and meaning of the opsonic index, and the method of preparing vaccines, while the various infections are treated at somewhat greater length with regard to their special requirements. A considerable number of individual cases is given to illustrate the selection of appropriate doses, and the results which may reasonably be expected from them in different circumstances. These include failures as well as successes, and the results of recent work in this country are summarised as fully as the scope of the work permits.

As the author himself recognises, however, accurate diagnosis is a prime essential of success, and this presupposes an acquaintance with practical bacteriology, which the general practitioner does not possess, and such a book as this can do little to supply. Some space indeed might well have been saved by omitting the altogether inadequate treatment of the method of isolating and recognising the organisms which may be found in a given case, and devoted to a more critical appreciation of the problems involved in bacterial inoculations.

Die Eiszeit und der vorgeschichtliche Mensch. By Prof. G. Steinmann. Pp. iv + 96. (Leipzig: B. G. Teubner, 1910.) Price 1.25 marks.

PROF. STEINMANN, with evident pleasure, contributes this work on the Ice age to a popular series issued by the firm of Teubner. The black letter type shows the audience for which it is intended, and it will admir-

ably carry on the campaign of the German geologists for a more general understanding of the earth. After indicating that an oceanic and moderately cold climate, rather than a continentally extreme one, will provide the conditions for an Ice age, the author appeals to the scenic features of a country where glaciers have worked their way. He supports the view of the over-deepening of valleys by glaciers, and clearly points out the effects of differences of pressure in different regions of a complex ice-stream. Prof. Heim would doubtless remark that the U-form indicated in the picture of the Lauterbrunnen valley (p. 21) is obviously due to taluses; but little fault can be found with the author's account of the variety of characteristic outlines traceable in all regions that have undergone an Ice age.

The etching out of cirques primarily by frost-action, as on the margin of melting snow, rather than by the glaciers that ultimately occupy them, is surely sustainable, in spite of what is said on p. 37; but we agree with the author that the erosive power of glaciers has been very freely underrated. The study of moraines and outwashed materials is used to explain the phenomena of the North German plain, and the lost freshwater lakes of Bolivia are introduced as evidence of the universality of the Ice age. New interest is aroused by the account of pre-Glacial and Glacial man with which the book concludes.

G. A. J. C.

LETTERS TO THE EDITOR.

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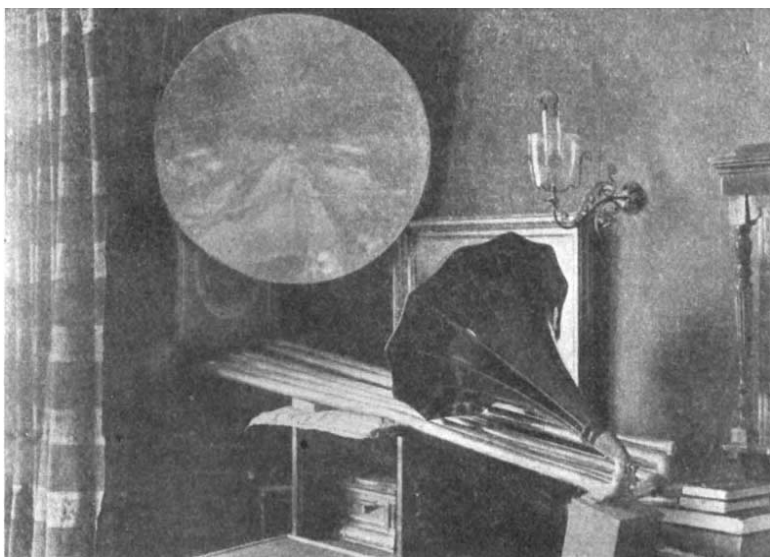
Further Experiments with the Gramophone.

IN NATURE of April 15 and October 21, 1909, I described various experiments with the gramophone. Since then I have made many efforts to get rid of the hissing and grating noises that detract so much from the instrument as a reproducer of musical sounds, and at last I have had an encouraging measure of success. The gramophone, as will be seen in the accompanying figure, is enclosed in a wooden cloth-lined box, and a tube passes tightly through a hole in the wall of the box from the end of the taper arm that carries the sound box of the instrument. When the sound box is tightly closed by raising and locking the front lid, as seen in the figure, the sounds of the machinery, and also the vibrations from the free side of the diaphragm of the sound box, are completely damped off. The noises, caused by the friction of the needle point on the hard disc of the record, pass, of course, along with the musical sounds, through the taper arm to the tube that escapes from the box. This tube is suitably connected with lengths of tin tubing, $1\frac{1}{2}$ inch in diameter, and the sounds are thus conveyed through as many feet of tubing as may be found necessary. I have found the most efficient length of the entire tube, until it reaches the horn or resonator (the attachment of which is seen in the figure), to be, say, 54 feet. The effect of the long tube, while empty, is to increase the volume of the tones, but, of course, the noises are also intensified.

I have always been struck by the fact that the friction noises seem to be quite separate and distinct from the musical tones, either when a voice is singing with an accompaniment, or during the reproduction of an orchestral

piece of music—indeed, by an effort of attention, I have so trained myself that I can hear one without hearing the other. This suggests that in the ear there is a mechanism for the detection of noises of high pitch as distinct from ordinary musical tones. It occurred to me that by causing the sounds to pass through numerous narrow channels, freely communicating with each other, the noise-sounds, presumably caused by short waves of high pitch, might be damped off by interference, while the longer waves, corresponding to musical tones, might pass through unaltered, except as regards loss of energy from friction. My purpose was attained by filling a segment of the tin tube, say, from 4 to 8 feet in length, with a mixture of hard peas and beans, corrugated by age or drying. The experiment succeeded. The friction noises were damped down, while the musical tones, although rather “dulled” in quality, that is to say they lacked brilliancy, were purer, and, to my ear, much more natural.

Other substances were tried—glass balls, marbles, small fir cones, gravel, shreds of tin—but the best effect was



Gramophone arranged to get rid of friction noises.

obtained with the peas. Brilliancy was obtained by using, as suggested and made by Mr. Ernest De la Rue (who has been much interested in these researches), zinc tubes filled with fragments of corrugated zinc, and the use of these has been protected by patent by Mr. De la Rue. By a combination of the zinc fragments with the peas and beans, I get delightful effects, so that the gramophone-music is so immensely improved that I cannot listen with any pleasure to the “naked” gramophone sounds, as the attention is not now disturbed by the “frying-pan” noises.

As listening to music so reproduced is a kind of auditory illusion, any contrivance that will heighten the illusion may be expected to give more pleasure if the illusion is of the right kind. Usually one feels a sense of unreality in the music apparently rising from the bottom of the “horn,” more especially in listening to a human voice. To get rid of this, I angle the horn, as shown in the figure, so as to reflect the sound waves from a tin reflector (parabolic in character) so placed as to send the sounds to the other side of the room. One then ceases, while listening, to think of either the gramophone or the horn, as the sounds come from the reflector, and the effect is much more real and natural.

I believe the application of this method of “acoustical filtration” may be applied by ingenious mechanics in such a way as to do away with the necessity of building up such an array of tubes as is seen in the figure. The method enables one, in a room of moderate size, to listen to pure music. One cannot help observing how it mellows a voice that, heard in the ordinary way, sounds harsh